

CLAIMS

Having described our invention, we claim:

1. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
 - a. a laser, positioned proximate said fixed position, with its beam directed toward said target object so as to create an impact point on said target object;
 - b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, with the field of view of said video camera directed toward said impact point on said target object;
 - c. measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera;
 - d. computation means for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera; and
 - e. oscillation means for oscillating said beam and said video camera field of view in synchronization so as to sweep said beam of said laser and said field of view of said camera across said target object while maintaining said impact point within said field of view of said video camera, so as to permit the computation of distances for a plurality of said impact points on said target object.

2. A device as recited in claim 1 wherein said video camera is a line scan camera.
3. A device as recited in claim 1, further comprising memory means for storing said computed distances to said impact points in order to create a surface model of said target object.

4. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
- a. a laser, positioned proximate said fixed position, with its beam not directed toward said target object;
 - b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, with the field of view of said video camera pointed in the same direction as said beam;
 - c. a galvanometer, having an oscillating shaft extending therefrom, and being positioned proximate said laser, with said oscillating shaft being oriented to obstruct the path of said beam and said field of view of said camera;
 - d. a mirror, fixedly attached to said oscillating shaft, and positioned so as to reflect said beam and said camera field of view out toward said target object, so that said beam creates an impact point on said target object which falls within said field of view of said camera, and so that an oscillation of said oscillating shaft causes the oscillation of said mirror, thereby causing said impact point and said camera field of view to sweep across said target object in synchronization;
 - e. measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera; and
 - f. computation means for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera.

5. A device as recited in claim 4 wherein said video camera is a line scan camera.
6. A device as recited in claim 5, further comprising memory means for storing said computed distances to said impact points in order to create a surface model of said target object.

7. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
- a. a laser mirror;
 - b. a camera mirror, offset a set separation distance from said laser mirror, and linked to said laser mirror so as to move in unison with said laser mirror;
 - c. a laser, positioned so as to direct a beam upon said laser mirror and from thence out to said target object;
 - d. a camera, positioned so as to view the impact point of said beam upon said target object through its reflection in said camera mirror;
 - e. means for oscillating said laser mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving said camera mirror in unison with said laser mirror so that said impact point is always within the field of view of said camera;
 - f. means for measuring the position of said impact point within said field of view of said camera; and
 - g. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

8. The device as recited in claim 7, further comprising memory storage means so as to record a plurality of computed distance measurements in order to build a mathematical profile of said target object.
9. The device as in claim 8 wherein said target object is moved past said laser mirror in a controlled fashion and wherein the linear motion of said target object is sensed by sensing means so that a plurality of said mathematical profiles of said target object can be computed, thereby allowing the computation of a full surface mode.

10. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
- a. a common mirror;
 - b. a laser, positioned so as to direct a beam upon said common mirror and from thence out to said target object
 - c. a camera, offset a set distance from said laser, and positioned so as to view the impact point of said beam upon said target object through its reflection in said common mirror;
 - d. means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;
 - e. means for measuring the position of said impact point within said field of view of said camera; and
 - f. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

11. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
 - a. a common mirror;
 - b. a splitting mirror, having a first angled side and a second angled side;
 - c. a projector mirror, offset a set distance from said first angled side of said splitting mirror;
 - d. a receiver mirror, offset a set distance from said second angled side of said splitting mirror;
 - e. a laser, positioned so as to direct a beam upon said common mirror and from thence upon said first angled side of said splitting mirror, and from thence upon said projector mirror, and from thence out to said target object
 - f. a camera, positioned so as to view the impact point of said beam upon said target object through its reflection in said receiver mirror, said second angled side of said splitting mirror, and said common mirror;
 - g. means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;
 - h. means for measuring the position of said impact point within said field of view of said camera; and
 - I. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point

within said field of view of said camera.

1. The system of claim 1, wherein the camera is a video camera.